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TRIP REPORT

3RD MEETING OF US/USSR STATIONARY SOURCE AIR POLLUTION CONTROL TECHNOLOGY WORKING GROUP

Held In
Moscow, USSR June 6-13, 1975

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of each Working Group readily agreed to the proposed cooperation.

This coordinated arrangement should have several advantages. It should bring new financial, manpower and technology resources to the program thus strengthening our ability to deal with the Soviets. It should reduce undesirable overlap and duplication. It should avoid one U.S. group compromising the negotiation position of the other with the Soviets. Perhaps most important, it provides a mechanism that spans R&D and technology application thus introducing the capability of technology transfer and industry input and evaluation into the program.

Separate protocols were proposed by each Working Group which include those activities for which the respective Working Group has lead responsibility. The other two coordinated activities are included via cross-referencing.

Considerable emphasis during the meeting was given to pushing the projects as early as possible into the stage of technology application. This theme was readily supported by the Soviets accounting in part for their acceptance and support of the 4 coordinated projects discussed above. In addition, the Soviets placed considerable emphasis on exploring markets for their developed technologies as well as potential sources for needed products and processes.

Examples of this emphasis include efforts by the Soviets to identify and/or get assistance in locating potential buyers of (a) their electrostatic precipitators, (b) a flow measurement instrument, (c) their dry coke quench process and (d) several products and processes developed for use in the chemical processing industry.

II. Reports for Individual Projects and Activities Covered During the Meetings.

PARTICULATE ABATEMENT TECHNOLOGY

Equipment Testing Program

Details relative to the ongoing test equipment testing program were discussed on the first day of meetings with the Soviets. We were advised that a sudden serious illness made it impossible for Mr. Kizim, leader of the test team scheduled to come to the U.S. on June 15, to carry out his duties. Mr. Lebeduyk indicated that the team could not come without him or a replacement and said he felt that it would take a minimum of 45 days to make the arrangements necessary to send someone else. Mr. A. B. Craig was advised of this development by telephone and agreed to try and adjust the schedule. It was concluded that contractors and cooperating industry groups would be asked to reschedule the tests 60 to 90 days after the original date. Mr. Craig advised that he would need at least notice to set up a new date for beginning the testing. This information was relayed to Mr. Lebeduyk who advised that he would work to such a schedule. A meeting will be held in the U.S. at the conclusion of the U.S. portion of the test work to assess progress and consider possible modifications to the test work to take place later in the year in the USSR. All schedules will be slipped by the amount of delay actually realized for the first testing.

The Soviets had worked up a recommended program for further cooperation which included joint development of an improved method for fine particulate measurements. The proposed fine particulate instrumentation program was not presented in sufficient detail to justify consideration at this time. We made a counter-proposal to do more plant testing under a program which would be cooperative with the energy working groups for the U.S. and the USSR. The U.S. energy group was represented in discussions by Mr. Kurt Yeager of the Electric Power Research Institute (EPRI) and Mr. Sabert Oglesby of Southern

Research Institute. The U.S. input to this project will come from testing activities already funded by the EPRI for the coming year. Under this project Southern Research will test eight high efficiency e.s.p's collecting power plant fly ash. The test method to be employed are comparable to the work to be done under the present US-USSR cooperative program. The project will begin with comparison of information on coals used in power plants of the U.S. and the USSR. Where similarity of coals exists the Soviets will do test work to generate data for comparison with some part of the information being generated by the EPRI program. The industrial air pollution control group will be responsible for project coordination and will keep the energy working group advised of program status so that they can participate as necessary for smooth integration of possible follow-up activity.

Electrostatic Precipitators

The project to cooperate in development of improved electrostatic precipitators has resulted in identification of four work areas where collaborative programs may be mutually beneficial. The first phase of this project has been aimed at cooperative enlargement of work begun in the U.S. to develop a performance model. It is to be concluded by a meeting between U.S. and Soviet experts in the U.S. in July 1975.

The Soviets proposed a general continuation of discussions and information exchange in 1976. The U.S. side proposed specific steps aimed at defining any possibility for cooperative projects at the earliest date. Four areas of common interest were agreed upon; 1) Model studies for design of precipatator installations 2) Conditioning of gases to aid precipitator 3) Studies of reintrainment due to electrode cleaning 4) Studies to improve reliability of precipitators and their components.

It was agreed that both sides would complete the information exchanged on these subjects by February 1976. The date was a compromise between earlier dates suggested by the U.S. side and later dates recommended by the Soviets. After full information on programs under way in both countries has been exchanged, meetings between experts will be scheduled for the second quarter of 1976 if sound collaborative possibilities can be identified.

The precipitator studies will be joint cooperation involving the energy working groups and the industrial air pollution control working groups. The industrial air pollution control group will be responsible for coordination of activities.

Preliminary Proposed Projects

The preliminary proposed projects (B Projects) were reviewed B-4 Control of Ice Fog was dropped by mutual agreement. B-1, B-2 and B-2 dealing with condensation scrubbing, mist elimination and fabric filters are to be considered again at some later date. Meanwhile no action will be taken for these areas.

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Recommendations - Particulate Abatement Technology

1. EPRI and the utility industry be encouraged through the energy committee to participate and/or observe as far as possible in the test work in the U.S.

2. The EPRI test program should be reviewed in detail and schedules for accumulation of information needed for preliminary exchanges of data called for in the protocal should be developed.

3. Rescheduling for the U.S. test work should be completed as soon as possible. Consideration should then be given to making the review meeting which is to be held in the U.S. a joint meeting with the energy working group and possibly other interested, industrial parties.

4. The upcoming visit by Soviet e.s.p. experts should be used as an opportunity to further define the state-of-the-art for Soviet precipitator technology. Consideration should be given to exposing them to the top U.S. experts in the four areas of stipulated common interest to assist in this connection.

Action Items - Particulate Abatement Technology

1. Procure information on coal (and ash) for the plants included in the EPRI test program. Assess its sufficiency for satisfaction of data requirement in the protocol, for the proposed test program.

2. Procure and assess information on power stations and precipitators being tested by EPRI. Relate to protocol requirements for proposed test program.

3. Develop questions needed for the visit of Soviet experts on precipitation. Questions should be designed to define the state-of-the-art for electrostatic precipitation in the USSR.

4. Develop a plan for transmission of information on electrostatic precipitation as required by protocol project on precipitator R&D.

Scrubbers

Discussions were held with Dr. Lebyduk and Dr. Trubitsyn regarding the extent of information available on the use of wet scrubbers in the collection of fly ash from electric power boilers and specifically the scope of their studies of scaling and fouling. Conflicting information was received from Dr. Lebyduk and Dr. Trubitsyn. According to Dr. Lebyduk, application of scrubbers to fly ash collection in the USSR is limited to non-alkaline or slightly alkaline ash. He was not aware of extensive investigations of pH control or other means for reduction of scaling.

Dr. Trubitsyn stated that scrubbers are used on more than 50 power plants in the USSR. They are limited to boilers of less than 250 mw capacity burning coal of less than 15% ash. Efficiencies of particle removal is 95-96%. According to Dr. Trubitsyn, investigations of scrubber technology conducted by the All-Union Thermotechnical Institute (VTI) include mass and heat transfer, efficiency of fine particle removal, in addition to scaling and fouling. Studies of scaling by the VTI were reported to include a detailed examination and characterization of the deposits and development of means for elimination or control of the deposits. As a result of the study, scrubbers can now be successfully installed on power plants where the ash contains less than 15% CaO.

The different responses to the question of work on scrubbers may reflect the fact that the investigations were made by the Power Ministry rather than NIIOGAZ.

Scrubber systems is one of the projects under the joint

program for which the Energy Working Group has lead responsibility. The Protocol of that group calls for the furnishing by September of information on the parameters, location and operation of the scrubbers installed in the USSR and details of the investigations into means for control of scaling.

Recommendations

The first step in determining the relevance of the reported work in the USSR would be a critical review of the data promised in September. This review could lead to additional questions which could be resolved by correspondence. If these reviews indicate that significant work has been done that would benefit U.S. programs, a team should be organized to explore the work in depth. Power companies with particulate scrubbers either installed or planned should be contacted with respect to their interest in further dialogue with the Soviet group.

Action Items

Since the Energy Working Group has lead responsibility for this program, the Environmental Working Group should only take the following actions:

1. Follow through to see that the information promised is transmitted.

2. Assist in evaluation of the material received.

3. Participate in future contacts in the scrubber field.

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Symposium

A suggestion was made by the Environmental sub working group that a bi-annual symposium be held dealing with specific problems of particulate control technology starting with a symposium to be held in the USSR in 1976. The Energy working group has proposed a symposium on control of particulate emissions from electric power boilers in the 1975-1976 time frame. It was decided that a second symposium would be unnecessary duplication and that the Environmental Working Group should cooperate and assist in the proposed symposium.

The Soviet side of the Energy Working Group has prepared and will submit to the U.S. side in June 1975 a draft of the recommended symposium topics. This draft will be reviewed in detail with respect to the topics proposed by the Soviet side and suggest contributions by the U.S. side. Pending approval by both sides, papers will be prepared and exchanged prior to the symposium. The symposium itself will take the form of a synopsis of the papers followed by detailed questions which could be prepared and submitted to the authors in advance.

The symposium was planned for 1975 but no communication had been received from the Soviet side prior to the June meeting. However, a program has been planned and will be submitted for a proposed symposium to be held in October.

Recommendations

The Environmental Working Group should request the opportunity to review the proposed symposium topics and make suggestions relative to the Soviet papers and possible contribution by the U.S. side of the E.W.G.

Action

Mr. Harrington should inform Mr. Falkenberry of the E.W.G. interest in the symposium and request the opportunity to review and contribute to the symposium.

PROCESS IMPROVEMENT AND MODIFICATION

A-Activity Items

A-7 Demetalization of Heavy Oil and Desulfurization

The main objective of this activity is to aid in the development of improved catalyst for the demetallization of heavy (residual) oil used for combustion which would permit increased sulfur removal at lower cost. A secondary objective is to provide a common base for comparison of technologies in both countries.

The activity was initiated in 1974 with Hydrocarbon Research Inc. (HRI) supporting the U.S. activities. The U.S. and USSR were to exchange heavy (residual) oils and the most promising of the demetallization catalyst being developed by HRI and the Soviets. Both organizations were to perform laboratory evaluation on combinations of both countries' catalysts and oils. The results of both groups will be combined in a joint report of the testing and evaluation of results.

In 1974, information on types of analyses to be performed, testing procedures and composition-characteristics of the oil/catalyst were discussed and agreed upon. Early in 1975, the U.S. forwarded their oil and catalyst material. The Soviet oil arrived in the U.S. later in the second quarter; while their catalyst material did not arrive until the end of May 1975. Mr. Manshilin of VNIINP stated that they have almost completed the test program. Additionally, Manshilin stated the results were quite good and he would like to meet with HRI to discuss the results. However, the late shipment of the Soviet material to the U.S. will cause a significant delay in the project and will result in a six (6) month slippage in the schedule. Whereas the laboratory testing was to have been completed by the end of June 1975; it will not be late in December 1975.

The Soviets recommended that they (3-men) visit HRI in September. At this meeting, the Soviets will review their test results and could discuss the U.S. preliminary results. This visit was agreed upon and at the same time one visit of the U.S. experts to the USSR was cancelled. Additionally, one additional trip for both sides late in 1976 was agreed upon mainly to allot resources in the Soviet planning cycle for 1976.

In general, Manshilin appeared quite happy with the testing results they have obtained. He also indicated that the Soviets felt that there would be a need for additional work under this activity. Furthermore, both sides agreed that the problem of denitrogenation of oils needed to be discussed and reviewed.

Recommendations & Comments

VNIINP appears quite willing to compre their laboratory results with the U.S. Additionally, the Oil Shale industry also falls under the Ministry of Petroleum. The U.S. organizations and especially EPA are quite interested in denitrogenation of oils (from shale and coal conversion technology as well as petroleum) and removal or isolation of specific pollutants harmful to health. In this area, the working group and other U.S. members need to prove and develop an appraisal of the Soviet background.

A-9 Combined Cycle Configurations, Fuel Gas Cleanup and Commercial Operations

This activity is the result of combining three (3) related activities (B-11, B-12, B-13) into one. The three "B" activities all relate to combined cycles (coal or oil) configurations and the problems of pollutant removal. The commercial operations area would interface the operators of various combined cycle plants to review design and operational parameters.

During discussions an agreement was reached that it would be more advantageous if the three activities were handled as one. This arrangement would permit a more orderly approach with proper sequence of events. The longest range and most undefined section would be the commercial operations. As of now, the type of cycles and rationale for their design will be reviewed prior to having to make a firm decision on cooperation. This is as it should be.

Mr. Maslennikov transferred the document that would fulfill the first task of this project. It was agreed that by August the U.S. would forward their document. This position is quite favorable. It will allow the U.S. to evaluate material received from the Soviets and will provide us with guidelines on the report we are to prepare. The schedule for action items was reviewed for the remainder of 1975 and for 1976.

Recommendation

This area of cycle configuration and performance is one of major interest to the U.S. The Soviets appear to be ahead of the U.S. when considering oil gasification, clean-up and commercial operations. I believe it is worthwhile to continue our efforts to determine basis and rationale of Soviet design and solutions to the various effluent steam problems and cycle control problems prior to agreeing to specific exchange on commercial operation.

A-10 Coal Enrichment - Froth Flotation

This activity on a mutual effort to combine U.S. and USSR development of froth flotation for pyrite removal was transferred to "A" category. Little discussion of the technology was held since A. W. Duerbrouck of the USBM visited the USSR in April (energy group) and at that time held discussions with Mr. Yegorov. More discussions will be possible when the activity is operational. Mr. Yegorov was informed of Mr. Durerbrouck's desire to spend more time during his next visit in discussions with various Soviet experts. Mr. Yegorov asked for a schedule from Duerbrouck.

Recommendation

This project has the best potential for providing a parity of information and input into the U.S. coal industry. This is related to Mr. Duerbrouck's group being involved in the broadest range of coal cleaning R&D in the U.S. and having excellent communications with the U.S. coal industry.

B-Activity Items

B-5 Coal and Oil Gasification

B-6 Coal and Oil Liquefaction

The U.S. side has not identified organizations to support this area but because the Soviets (and U.S.) have great interest in this technology, it was agreed that project would remain in the "B" category. It was further agreed that visits by both sides would take place in 1976. The Soviet experts in this area have not visited the U.S. and as a result, there has been only very minor interfacing with the U.S. organizations. Cooperation with the Soviets in this area is further complicated by the lack of input from the energy groups working on their cooperative activities.

B-10 Economics of Oil Desulfurization

At the U.S. side recommendation, both sides agreed to eliminate this proposal from further consideration. Initially this activity was proposed by the Soviets. We have never been able to reach an agreement on the intent or requirements of the activity. It was further agreed that the termination of B-10 does not infer that costs will not be discussed or addressed in other activities.

Action Items

3rd Quarter 1975	Reports on B-9, B-10 need to be forwarded to the USSR.

Gaseous Emissions Control

The USSR effort in the field of SO_2 control appears to be centered in the design and future construction of MgO and ammonia processes at their Ryazan electric power generating complex. They also have a large limestone scrubber at the Magnitogorsk iron ore sintering plant. Support data for these facilities comes from various other places, notably a large (20,000 scfm) pilot plant at Severo-Donetsk. These facilities and the support data have been identified by the U.S. as the most promising source of useful information. Our U.S. program has as its major objective interfacing with the appropriate USSR ministries and obtaining this information.

The status of the existing protocol tasks of the Project and appropriate sections of the Working Group were discussed. The Soviet side expressed concern about their ability to interface with their Iron and Steel Ministry to get certain reports. The Magnitogorsk visit may also be difficult to schedule because of this.

Many items were behind schedule. The reasons were discussed and satisfactory resolutions were generally obtained. Exceptions were the withdrawal by the U.S. of the benzoic acid studies at Shawnee from the test plan. Many of the USSR tasks were not yet due. We received the answer "on schedule".

The USSR reports given us are usually specially bound and presented as if the sole purpose of the work were in fulfillment of the US/USSR cooperative task. The U.S. reports are presented in their normal covers as part of a U.S.-only project. This gives them some bargaining advantage.

The Soviet side brought up two areas for commercial opportunity. The first involves the use of U.S. instrumentation (SO_2 and NO_x monitors) at their Severo-Donetsk facility. They would like a free evaluation of instruments in exchange for possible purchase of these instruments for future plants.

The second subject is the commercialization of a flow monitoring device for which the Soviets have obtained a U.S. patent (3,803,911). They have suggested the installation of this device at Shawnee. This they feel would introduce it commercially in the U.S. I am sure any other course of action to accomplish this goal would be acceptable to them.

The USSR side had a list of suggested new areas of cooperation. These had not gone through the normal procedure of discussion and recommendation by the Project. These proposals represented a major effort by the USSR to get significant numbers of Soviet personnel on site at two large size installations. The first, in the limestone area, was an exchange of three people for 30 days. The facilities suggested were Shawnee and Severo-Donetsk. The second suggestion was in the Mag-Ox area for an exchange of three people for 30 days. The facilities suggested were a U.S. operating MgO facility and later at Ryazan after start-up (about 1980). A third exchange to investigate ammonia process regeneration at TVA's Colbert pilot plant and again at Ryazan was proposed.

The USSR side pressed hard for inclusion of these areas in the protocol of the Working Group. The U.S. side declined. The Soviets pressed hard for and received a recommendation for the U.S. side to consider their proposals and negotiate on them during September 1975 meeting in the USSR.

Technical details were discussed for some of the emerging work. There appear to be opportunities for actual integrated cooperative efforts in these smaller projects. Two such areas were discussed.

The first opportunity is in the lime/limestone area. It involves the USSR investigating the rate of oxidation of sulfite to sulfate as a function of oxygen content, bulk solution composition, and trace metal catalysts (e.g. Fe and Mn). The U.S. side would investigate the influence of percent oxidation on the composition of the solid produced (Bob Borgwardt's subsaturated sulfate phenomenon). Together they would be a viable whole as a design or operating analysis technique.

A second area was the production of elemental sulfur from $MgSO_3$. The U.S. is doing theoretical work and the USSR bench-scale experimental work. These could be combined and a future joint experimental program worked out. The USSR side mentioned a possible USSR patent position but rapidly backed down.

Recommendations

The Working Group can help the commercial aspects of Soviet interest in instrumentation primarily as an information conduit. It is suggested that manufacturers be contacted through a trade association or CBD advertisement. These could be handled through DOC with us as informed observers.

The USSR flow measuring device is not technically required at Shawnee. The marketing of the USSR flow measuring device will also require contact with possible U.S. licensees. If the USSR can get any expression of interest from at least one significant U.S. manufacturer and is willing to foot the bill for a Shawnee demonstration, it would be a reasonable thing. Our flow measurements at Shawnee are presently satisfactory.

The next area is reciprocal exchange of personnel at major U.S. and USSR installations. For the U.S. to benefit we must have the involvement of the following groups and their contractors: EPA, process and equipment vendors, and users. The USSR side wishes to negotiate agreements in the lime/limestone

and MgO areas and, to a lesser extent, the ammonia area.

The first task in committing to the arrangement would be obtaining an expression of interest from the various groups mentioned above with respect to areas. While trade associations, e.g., EPRI, IGCI, or EEI might be politically viable candidates, care must be taken that they can fulfill the financial and technical aspects of the total problem. Table 3.2-1 is a list of the types of suggested organizations that should be involved. It is not meant to be restrictive or inclusive.

A expression of interest must be followed by a statement of objectives, an evaluation of alternatives, and a commitment of funds.

The initial USSR position was one of being equal or ahead of the U.S. in MgO and NH_3 and not being particularly interested in lime and limestone. The U.S. assessment was they were, overall, hopelessly behind us in line/limestone technology, considerably behind us in MgO, and perhaps equal in ammonia. They are extremely anxious to availa themselves of our demonstration and prototype technology. While they have very little to bring to the party, they do have something.

A fair bargain for us would be a significant U.S. personnel involvement in MgO at Severo-Donetsk before they switch to limestone in 1976. Then the USSR could participate on a reciprocal basis at Shawnee. We would then work out a few tests for the USSR to conduct at Severo-Donetsk when the USSR has the operation lined out in, say mid to late 1976.

USSR personnel involvement at an operating U.S. MgO station for "tests" will be a design copying affair. The U.S. return on this will not be until 1980 barring any schedule slip or USSR project cancellation. We have already

bargained for the Ryazan MgO data in exchange for our Boston Edison data. Something from another area - technical, political, or economic, should be part of a U.S. negotiation. This is beyond the scope of the report to make recommendations as to what additional price the USSR should pay.

Next the small developing project of calcium sulfite oxidation/recipitation, and elemental sulfur from $MgSO_3$ will be considered. These appear to be in a much better position for a truly cooperative effort because they are near the beginning, not the end. It is recommended that their inclusion into EPA's CSL program be seriously considered. Involvement of the vendor and user groups could then be included in EPA's existing strategy.

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TABLE 3.2-1

SUGGESTED ORGANIZATIONS FOR INVOLVEMENT

Group \ Area	Lime/Limestone	MgO	NH_3
EPA	CSL, nonregenrative section TVA	CSL, regenerative section	CSL, regenerative section TVA
Vendor	IGCI Chemico B&W C.E. Radian AAF R.C.	IGCI Chemico U.E. ? Radian	?
User	EPRI EEI Individual Utilities Etc.	EPRI EEI Individual Utilities Etc.	EPRI EEI

CEMENT INDUSTRY POLLUTION CONTROL

The Soviet Construction Industry Ministry initiated contact to explore cooperation under the US-USSR environmental agreement in a letter of December 26, 1973 from Israel to Train. (The Israel letter was delayed enroute over 3 months) Insufficient time (one month) to respond and lack of interest by the cement trade association, Portland Cement Association, made it necessary to decline two invitations by the Soviets to send a delegation to the USSR to visit Soviet plants and explore cooperation. In view of continuing interest by the Soviets in this area, we have identified an interested U.S. group (including control equipment suppliers which is responsive to the expressed interest of the Soviets).

In response to our agreement with the Soviets that there be a representative of the USSR Cement Industry present, Mr. Vodolaskiy (Director, Cement Industry Research Institute) travelled from Novorosiysk (about 1000 Km from Moscow) to participate in the Working Group meeting.

We found a high-level of interest by the Soviets in exploring a cooperative opportunity in the area of pollution control in the Cement Industry. The Soviet's cement industry group has prepared a proposed agenda, as we have requested in our earlier letter (hand delivered to Anikeyev in October 1974). They agreed to our recommended schedule of September-October, 1975 for a

visit of the U.S. delegation (no EPA personnel is expected to be included in this visit although the option is available if it seems desirable later) (The September-October time period was suggested by some of the cement industry's representatives contacted) The proposed agenda for the U.S. delegation is as follows; it is a tentative subject to find approval by the ministry:

Day	Visits
1st	Arrive Moscow--met by Ministry of Building Materials
2nd	Moscow-Ministry of Building Materials and travel to Ulyanovsk
3rd	Visit cement plant
4th	Travel to Volgograd
5th	Visit Mikhalovka cement plant
6th	Visit Serebryakov cement plant
7th & 8th	Visit city of Volgograd and travel to Krasnodar (plane) then drove to Novorosiysk (free time during weekend)
9th	Visit institute of Cement Industry
10th	Visit Novorosiysk cement plant
11th	Depart for Moscow (by plane) and hold discussion at Ministry
12th	Day off
13th	Return to USA

The Soviets also agreed to respond to the questions and request for materials contained in our letter of October 1974. We were told this response has been completed and the material is now being translated.

Due to the preliminary nature of our meetings, we were unable to assess the potential for scientific; technical or economic yield of US-USSR interface in this area. It should be explored by a team qualified to objectively evaluate the potential before a more permanent cooperative activity is included in the environmental program.

Recommendations

(1) U.S. side through the assembled industry team should prepare and send state-of-the-art summary of the type requested from the Soviets (letter of October 1974) as an information basis for the forthcoming visit to the USSR.

(2) U.S. side should thoroughly evaluate the results of the Soviet response to the October 1974 letter when it is received. This, plus additional studies of the Soviet Cement Industry from available literature, should permit evaluation of the proposed visit agenda and maximize the U.S. yield of the planned visit.

(3) The U.S. delegation should make the planned visit to the USSR.

ENVIRONMENTAL IMPACT OF OIL SHALE PROCESSING

During last year's Working Group meeting and subsequent sub-group meetings, we tried to introduce the area of pollution control from the oil shale industry into the US-USSR cooperative agreement. The basis for our interest is that the USSR has been processing oil shale in Estonia for over 20 years. They have also conducted work to define the nature and magnitude of environmental problems associated with the process. Although NIIOGAZ initially agreed to this they were subsequently thwarted by the Petroleum Ministry under which this technology falls. The reason for the Ministry's position was that they are currently attempting to market the oil shale processing technology in the U.S. and their marketing group, Licensetorg, is concerned about jeopardizing the Soviet position. Because of the unique occurrance of this technology and environmental impact information base, we attempted to get the Soviet side to renew efforts to get the program incorporated into the cooperative program.

The highest level of success in getting this project review established was the result of the Train-Israel mid-year review meeting (June 9, 1975). At our request, Mr. Train raised the issue and proposed that in addition to trying to persuade the Petroleum Ministry to undertake an active pollution control technology cooperative program, that a health effect information exchange project be initiated with the appropriate working group (Dr. Raul of NIH, on the U.S. side, I believe). The Soviets agreed.

We also included in our protocol a Soviet agreement to try to reinstate the control technology as part of the proposed cooperation.

Recommendations

1. Keep pressure on the Soviet side to convert this area to an active project. Success in this area will either provide reliable information in this emerging area and/or establish the maturity of the Soviet technology.

2. Coordinate with Raul's working group.

Dry Quenching of Coke

The U.S. iron and steel industry and government for a period of time now have been interested in the Soviet-developed dry quenching of coke process. Because the process' environmental impact is much lower than that of the wet quenching iron used in the U.S. and because of its greater efficiency, the Working Group included in its program a project aimed at technical evaluation of the process in sufficient in detail to provide information to the American industry which would enable them to make an educated decision whether the license for the system in the U.S. is desirable.

The American Iron and Steel Institute and EPA developed a minimum data requirement needed from the Soviets before the decision would be made. The data needed included 10 tons each, samples of Soviet coal and dry quenched coke for the American Iron and Steel Institute. The samples would be taken in the presence of the American representative. It is the fulfillment of this part of the agreement by the Soviets which was uncertain at the time of our arrival for the Working Group meetings.

The issue was raised first at our meeting with Balashov on June 6. He informed us that it was his belief that the samples were coming but that Mr. Yegorichev would be present at the formal Working Group meetings and details would be available at that time.

In place of Mr. Yegorichev, his assistant, Maksimov, was present. He stated that the Ministry of Iron and Steel agreed to the entire program and that it was his understanding that the Ministry of Foreign Trade (Licensetorg) has also agreed and that the samples were being prepred and probably within two months would be sent to the U.S. Upon raising the question for the purpose of inclusion to the Soviet agreement in the protocol, we could not come up with the phraseology which Maksimov was willing to include. Finally he indicated that Licensetorg's presence was necessary before any statement could be included in the protocol. Licensetorg was to come to the meetings on Tuesday. They did not come but we were promised a meeting with them on Thursday, again with no luck. Finally, following our insistence, Mr. Yegorichev, by phone notified us that Licensetorg agreed to send the samples within three months and a letter to that affect will be coming to AISI. The words now in the protocol, reflect that agreement and were coordinated with Licensetorg.

Action Items

1. Review with Norm Plaks and AISI
2. If within one month no further communication is received on the issue from the Soviets communicate with them especially raising the issue of desirability of having American representative present during taking of samples.

Recommendations

1. The Working Group should continue to provide a communication center for the U.S. industry and Soviet Licensetorg assuring American

industry does obtain sufficient amount of information in order to make a decision. In the past, scattered attempts by the U.S. industry were not powerful enough to impact on the Soviets to provide sufficient data for the decision making. Working Group should stay involved until no longer serves a useful function, probably when the decision to buy or not has to be made and sufficient data on the process is available.

Other Programs of the Task Force - Ferrous Metallurgy

The Working Group met with Mr. Maksinov of the Ministry of Iron and Steel. Mr. Yegorichev was absent and only on Thursday, June 12, did we carry on a telephone conversation with him. (related to dry quenching).

The Working Group essentially approved the program of the Iron and Steel Task Force in the areas as they were identified during November and December 1974 meetings. Tentatively, two meetings were scheduled for 1976, one in the U.S. and one in the USSR to continue the information exchange and development of the cooperative activities. The meetings are to be further agreed to and their specific purpose defined by Mr. Petrikeyev and Mr. Norm Plaks. Mr. Maksimov had not at the time of the Working Group meeting received Norm Plaks' letter with the itinerary for the 3rd quarter '75 visit. We transmitted a copy of the letter with the proposed itinerary.

Action Items

1. Review the meeting with Norm Plaks.

Recommendations

1. Insist on the report and visit of the Magnitogorsk limestone scrubbing facility through the Ministry of Iron and Steel, find out more and carry this program through the Iron & Steel Task Force.

2. Pursue diligently areas of cooperation to find subjects where active programs above information exchange would be beneficial, identify those areas which would be of high enough interest to the U.S. Iron & Steel Industry to involve their active participation.

CONTROL OF POLLUTION FROM
NON-FERROUS METALLURGY INDUSTRY

The EPA research and development programs in the area of pollution control from non-ferrous metallurgical plants include not only domestic activities but also programs and information exchange with other nations. It was found that data from industries in other countries can provide a significant input into the total data base needed for development and improvement of pollution controls in that industry. At the suggestion of Norm Plaks of the EPA's Control Systems Laboratory, the Working Group agreed to try to set up preliminary meetings with the USSR Ministry of Non-ferrous Metallurgy to investigate their interest in a cooperative program with the United States. In advance to leaving for the Soviet Union, Norm Plaks supplied the Working Group with a short description of the non-ferrous metallurgy in the USSR. A more detailed report has been prepared for EPA which should prove helpful in the development of specific proposals for cooperation. It would appear (based on this report) that the Soviet technology is at least on par with the U.S. and in some areas (wider use of electric rather than reverbatory furnaces in copper smelting) more advanced.

In response to our request to include non-ferrous area as a subject for new cooperative activities in the Working Group, Mr. Arashkevich, representative of the Ministry, was present during the entire Monday meeting even though the time available

for our discussions with him was rather limited due to other business. From our discussions with him, it is clear that the Ministry has a high level of interest in cooperative activities not only in the field of air pollution but water as well. Arashkevich indicated that he now needs specific proposals as to the areas and types of activities in which the U.S. would be interested. The U.S. needs to prepare those either in a letter to the Ministry or ask for a meeting during which these would be presented or both. He preliminarily agreed to a meeting with Norm Plaks during 3rd Quarter, 1975. Following the USSR proposals, the USSR will answer with theirs within three months.

It is recommended that before any proposals are prepared, we gather more information on the state-of-the-art in the Soviet Union including information on any cooperative activities that the U.S. might be involved in, at the present time, with the Soviets. A good starting point might be looking into the background of the non-ferrous metallurgy exhibit to be held in November in Moscow, in the U.S. Embassy Commercial Center.

Action Items

1. Review meetings with Norm Plaks to assure his understanding and concurrance before preparation of proposals.

2. Contact Copper Smelter Research Institute to investigate their interest in participation in a program with the Soviets and to recruit their assistance & evaluation of the potential from

cooperation with the Soviets.

3. Find out if other organizations in the U.S. are cooperating with the Soviets.

4. Obtain information on the background of the November 1975 exhibit of non-ferrous industry in Moscow.

5. Decide how to include water pollution programs in the proposals for cooperation.

6. Prepare letter to the USSR with proposals or asking for a meeting.

AIR POLLUTION EXHIBIT IN MOSCOW, FEBRUARY 1976
MEASUREMENT INSTRUMENTATION AND CONTROL TECHNOLOGY EQUIPMENT

We took the opportunity of our visit in Moscow to meet with the U.S. Embassy's Commercial Section, on the air pollution exhibit-seminar scheduled for early next calendar year. This project is in part the result of the Train-Israel agreement to hold technological exhibits and/or fairs in each country. A joint State Department and Department of Commerce exhibit-seminar program provides the opportunity for partial fulfillment of this agreement. We have been asked to assist in the DOC-EPA sponsored air pollution exhibit and seminar to be held February 6-12, 1976 in Moscow. The purpose of our visit was to get background on the purpose of the project and get exposure to the Embassy's view of what the project is intended to accomplish and relative roles of State, DOC, and EPA; inspect and evaluate the facilities.

The overall program sponsored by State and DOC jointly is only one year old. The purpose is to try and assist U.S. industry to develop markets in the Soviet Union. The programs are structured around specific topics and/or industries. Examples in the environmental area include water pollution control and air pollution instrumentation and control technology (the latter is the Feb. 6-12 program). Each program involves an exhibit and seminar that lasts about a week.

Exhibitors are selected by DOC although EPA can participate to assure the technical content of the seminar program. Because of a serious limitation on space (exhibit room is about 25'x30'), exhibitors are kept to 6 or 7 and even then exhibits are restricted to small equipment, posters, slides, etc.

The seminar under the guidance of EPA is a series of about one-hour presentations followed by a question and answer period. Three such presentations are scheduled per day over a three-day period. Presentations are state-of-the-art, technical presentation; not advertising. Preferably the seminar is to be conducted by a chairman from EPA but this is not necessary. In the absence of a chairman, the Commerce Section of the Embassy acts as chairman. (Their chairing, however, is quite limited leaving presentor on their own most of the time.) The seminar area is about 30'x50' and can accommodate over 150 attendees. Typical audiences are around 100.

Exhibitors are the source of material for the seminars; therefore, the interaction with EPA in selecting exhibitors. Exhibitors in addition to paying for all of their own transportation, materials and maintenance, are assessed $500 for support of Dept. of State arranged receptions, etc.

It appears that the nature of the Programs can be essentially controlled by EPA.

Recommendations

1. It appears that ORD support of this program will be necessary and to assure a responsible program, desirable.

2. It would appear desirable (although not essential) to have an ORD chairman at the seminar.

3. This project is probably best handled by the headquarters of ORD.

Action Items

1. Arrange to have this activity covered by Headquarters Personnel.

2. Pass information regarding visit and discussions to D. Strother, OIA and W. Brown, Special Assistant to R. Train.

Approved For Release 2000/09/06 : CIA-RDP79-00798A000800040001-5

REPORT OF VISIT TO VOLGOGRAD INSTITUTE OF TECHNOLOGY FOR CHEMICAL AND PETROLEUM MACHINERY

This institute is located at Volvograd about 1000 km from Moscow. The institute employs about 1400 people. Their principle sphere of responsibility is as follows:

1. Design of equipment for the chemical and petroleum industry as based on customers' specifications. The only design, fabrication is delegated to other organizations. In this capacity, they perform the additional tasks of:

   A. Type of tools, schedules and procedure for fabrication.

   B. Reliability studies and improvement

   C. Start-up and operation for acceptance test.

2. Design and development of automated metal working techniques such as welding, strapping, rolling, etc. The institute does offer these designs for sale.

3. Chemical and corrosion treatment for ferrous-based metals.

4. Metallurgical research and development.

5. Economic studies of production for manufacturing lines.

6. Foundry Techniques.

The institute produces designs for both high and low temperature and pressure machinery. Additionally, they have been long involved in designs of gaseous water cleaning equipment.

In the welding area, their development appears to be concentrating on the use of unflux continuous feeding wire or strip both for automated systems

and manual (wire) systems. Most of this development is based on special alloy steels that are normally used in these industries.

The representatives of the institute stated they sell competitively in the free world markets as well as in the Soviet block. These include such countries as France and Germany. Their trade exhibits cover Western Europe, Africa and Peru of South America. They also state their equipment, reliability and operations were competitive.

The organization appears to be good and competent. They also stated that they would be more than happy if we cared to inform U.S. companies of their areas of interest.

III. ITINERARY AND PERSONNEL MET

3rd Meeting of US/USSR Stationary Source Air Pollution Technology Working Group

Friday June 6	- preliminary meetings at Glavgazoochistka with Balashov, to prepare report for Israel - Train Mid-year review session and review agenda for Working Group.
Sunday June 8	- meetings of the American delegation to review status of ongoing cooperative activities and prepare for Working Group discussions
Monday June 9	- NIIOGAZ - discussions of ongoing cooperative activities - program planning for 1976 cooperation in each project area
Tuesday June 10	- Discussions and planning of joint programs under the US/USSR Environmental and Energy Working Groups
Wednesday June 11	- visit to Volgograd Institute of Petroleum and Chemical Machinery
Thursday June 12	- - final discussions and preparation of protocol - signing of protocol
Friday June 13	- departure from Moscow

* Personnel met except for Volgogard Machinery Institute listed in Appendix 1 Protocol of 3rd meeting of the Working Group.

Personnel met at Volgograd Institute of Chemical and Petroleum Machinery during June 11, 1975 meetings.

K. S. Zlobina	Institute director
G. P. Salnikov	Director of plant serving the Institute
V. A. Samoylov	Deputy Director of Institute
A. A. Rozentsvet	Chief of Scientific-Technological Division, Deputy to Chief Engineer
Yu. G. Tolochko	Chief Design Engineer
M. A. Khubrikh	Scientific Secretary

IV. MATERIALS RECEIVED

Gaseous Emissions Projects

1. In satisfaction of A-1 Activity Limestone Scrubbing for Sulfur Oxide. Removal from Stack Gases of Power Stations of

   Task 2 - SO_2 Absorption Kinetics - Studies on Severodonetsk Pilot Installation

   Task 5 - Experimental Methods used in NIIOGAZ and Severodonetsk Power Stations

2. In satisfaction of A-2 Activity Magnesia Scrubbing for Sulfur Oxide. Removal from Stack Gases of Power Stations

   Task 8 - Experimental methods ....

   Task 9a- Study of Venturi efficiency with gases of high heat content

VNIIPT - All-Union Research and Design Institute for Chemical and Petroleum Machinery - (Brochure on Scope of Work)

Gaseous Emissions Projects

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VNIIPT - All-Union Research and Design Institute for Chemical and Petroleum Machinery - (Brochure on Scope of Work)

P75-384

F.

PROTOCOL

of the 3rd meeting of the American/Soviet Project Team on Improvement and Modification of Technological Processes of the Working Group on Stationary Source Air Pollution Control Technology

02.01 - Environment WG-I Air Pollution

CCS
DSI
DEP
DCCRC STATINTL [redacted]
4 mil
CRS
file
(Environ)
WGI 23 Jun 76

STATINTL

STATINTL from LESS - attached [redacted]

STATINTL to [redacted] for Comet use.

XS

In accordance with the protocol of the 3rd meeting of the American/Soviet Working Group on Stationary Source Air Pollution Control Technology [Moscow, USSR during 6-13 June 1975], a meeting of the American/Soviet Project teams on Improvement and Modification of Technological Processes was held in the U.S.A. during 26 September - 10 October 1975.

The Soviet Delegation was headed by Mr. V.M. Maslennikov, Chief of Institute of High Temperature Laboratory, USSR Academy of Sciences. The American Delegation was headed by Mr. T.K. Janes, Chief, Fuels Process Branch, EPA. Participants of these discussions are listed in Appendix I.

The Soviet Delegation consisted of representatives from the USSR Academy of Sciences, USSR Ministry of Energy and Electrification, USSR Ministry of Coal Industries and the USSR Ministry of Chemical and Petroleum Machine Building. The American Delegation included representatives from the US Environmental Protection Agency, Battelle Columbus Laboratories, Electric Power Research Institute, United Technology Research Center and the Research Triangle Institute.

The Soviet side was accorded an opportunity to visit several U.S. organizations working in the area of combined cycle configurations, coal gasification, fuel gas cleanup techniques and electrical power generation. A list of organizations visited is included in Appendix II.

The specific topic under discussion was item A-9, "Complex Methods of Fuel [coal and oil] Usage in Energy Generation Systems with Prevention of Harmful Emissions into the Environment" as identified in the June 1975 Working Group Protocol.

At this meeting, the information forwarded by the Soviet side and presented by the US side was reviewed and discussed. Both sides further agreed that they would not publish a joint report as stated in Task II of subject A-9 [June 1975 Protocol], but a joint report will be issued after the total exchange of information and calculations has been completed. The outline of this joint report is in Appendix III. However, both sides agreed that it may be worthwhile to issue a joint interim report or joint publications at a later date. Additionally, the American side recommended that the Soviet report by Mr. Maslennikov be published by EPA for distribution in the US. The Soviet side agreed to these recommendations.

After discussion of the exchange of information and identification of additional data required, both sides agreed to the future work that is to be accomplished, and the outline of the future work is presented in Appendix IV. The next meeting of the Project Team will be held in the USSR in May, 1976 and the program is listed in Appendix IV. Both sides agreed that the subject of topic A-9 is of great interest to both countries.

Both sides noted that the meetings were concluded in the spirit of friendship, mutual understanding and cooperation.

The protocol was signed on 9 October, 1975 at Research Triangle Park, N.C., USA in Russian and English, both texts being equally authentic.

For the US Delegation

T.K. Janes
Head of the USA Delegation
Chief, Fuel Process Branch
EPA

G.R. Smithson, Jr.
Manager, Environmental Programs
Bettelle Columbus Laboratories

For the Soviet Delegation

V.M. Maslennikov
Head of the USSR Delegation
Chief of Laboratory IVT,
Academy of Sciences

M.V. Gurychev
Head of Glavtsentroenergo
USSR Ministry of Energy

Appendix I

Participants of the 3rd meeting of the USA/USSR teams on "Complex Methods of Fuel Usage in Energy Generating Systems with Prevention of Harmful Emissions into the Atmosphere."

USSR

Mr. V. M. Maslennikov	Head of the Laboratory at the Institute of High Temperatures, USSR Academy of Sciences
Mr. M. V. Gurychev	Head of Glavtsentroenergo, USSR Ministry of Energy and Electrification
Mr. V. L. Panov	Director of the Dzherzhinskaya Heat and Electric Power Plant, USSR Ministry of Energy and Electrification
Mr. V. L. Savin	Chief Engineer of VNJPJE, USSR Ministry of Energy and Electrification
Mr. Y. A. Vyskubenko	Senior Scientific Worker at the Institute of High Temperatures, USSR Academy of Sciences
Mr. R. A. Solovev	Head of Research Group of the Institute of High Temperatures, USSR Academy of Sciences
Mr. Y. M. Afanasev	Head of Laboratory of NIIOGAS, USSR Ministry of Chemical and Petroleum Machine Building
Mr. G. V. Klirikov	Senior Scientific Worker at the Institute of Fossil Fuels, USSR Ministry of Coal Industries

USA

Mr. T. K. Janes	Chief, Fuel Process Branch, IERL-RTP, EPA
Mr. Mark J. Stutsman	Chemical Engineer, IERL-RTP, EPA
Mr. G. Raymond Smithson, Jr.	Manager, Environmental Program, Battelle-Columbus Laboratories

Mr. C. Malcolm Allen	Program Coordinator, Energy/Environmental Systems, Energy Systems and Environmental Research Section, Battelle--Columbus Laboratories
Mr. David Ball	Staff Scientist, Combustion Systems Section, Battelle--Columbus Laboratories
Mr. Herbert Hazard	Principal Engineer, Fuels and Combustion Systems Section, Battelle--Columbus Laboratories
Mr. Alexis W. Lemmon, Jr.	Chemical Engineer, Energy Systems and Environmental Research Section, Battelle--Columbus Laboratories
Mr. James F. Shea	Chief, Plan Approval Section, Division of Industrial Waste Water, Ohio Environmental Protection Agency
Mr. David Goodwin	Public Health Engineer, Plan Approval Section, Division of Industrial Waste Water, Ohio Environmental Protection Agency
Mr. J. W. Lizon	Plant Manager, Gavin Station, Ohio Power Company
Mr. R. Eason	Performance Supervisor, Gavin Station, Ohio Power Company
Mr. D. Crabtree	Senior Performance Engineer, Gavin Station, Ohio Power Company
Mr. J. W. Ruff	Environmental Affairs Director, Ohio Power Company
Mr. R. Moore	Plant Manager, Western Chemical Division, Dow Chemical Company
Mr. A. Hoch	Manager, Organic Chemicals of Western Chemical Division, Dow Chemical Company
Mr. C. Graham	Energy Technical Expert, Western Chemical Division, Dow Chemical Company
Mr. A. Gunkler	Chief Engineer, Western Chemical Division, Dow Chemical Company
Dr. C. Starr	President, EPRI
Dr. R. E. Balzhiser	Director, Fossil Fuel and Advanced Systems, EPRI

Dr. S. A. Alpert	Technical Manager, Process Development, EPRI
Mr. K. Yeager	Technical Manager, Environmental Control and Combustion, EPRI
Mr. N. A. Holt	Program Manager, Gasification, EPRI
Mr. R. Carr	Project Manager, Environmental Control and Combustion, EPRI
Mr. V. Cooper	Program Manager, Thermal-Mechanical Energy Conversion and Storage, EPRI
Dr. Forest O. Mixon	Manager, Process Engineering, Research Triangle Institute

Interpreters

Mr. J. Pekar	Research Associate, IERL-RTP, EPA
Mr. Basil Goreff	Battelle--Columbus Laboratories

APPENDIX II

U.S. Organization Visited

Battelle Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

- Laboratories in Columbus
- Gasification pilot plant at West Jefferson

Gavin Power Plant
Ohio Power Company
Cheshire, Ohio

- Coal fired base load conventional power plant with 1300MW boilers

Dow Chemical Company
Western Chemical Division
Pittsburg, California

- Combined cycle with gas turbine generating electricity and waste heat boilers generating steam

Electric Power Research Institute
3412 Hillview Avenue
Palo Alto, California 94304

Research Triangle Institute
Post Office Box 12194
Research Triangle Park, N.C. 27709

APPENDIX III

The structure and main contents of the final report for Subject A-9.

1. Fuel Energy Balance and Environmental Protection Problems
   - Analysis of the major trends for the development of electrical energy in both countries
   - The objective of this report is to determine the future impact that combined cycle electric generating techniques will have on each country's power generation capacity, base load, peak load and combined heat and power production
   - The basic requirements of fossil fuel fired electric power stations with respect to environmental protection
2. Basic Principles and Assumptions for the Technology and Economics Selection of the Various Configurations
   - The capital cost structure of an electrical power station with fuel gasification
   - Basic configurations
   - Procedures for calculating operating cost and cost of electrical power
   - Annual operating time in hours and load curve for the plant
   - Flue gas cleaning and other discharge control efficiencies
3. Selection of Optimal Combined Cycle Configurations for Operating at Base Load Conditions
   - Rationale for selection of best systems
   - Basic data for comparison

- Flow diagrams and configuration descriptions
- Status of state-of-the-art and commercial feasibility
- Analysis of problems requiring further research and development
- Analysis of thermodynamic efficiencies
- Determination of optional capacity of single generating units
- Determination of quality of fuel gas for gas turbine operation and working fluid in the gas turbine

4. Selection of Coal Gasification and Fuel Gas Cleaning Techniques
   - Analysis of various coal gasification and fuel gas cleaning techniques
   - Gasification operational requirement for use in a combined cycle configuration, such as load variance
   - Rationale for selection of the optimal gasification configuration
   - Flow diagram and description
   - Analysis and sections of the optimal processes and parameters
   - State-of-the-art and commerical feasibility
5. Selection of Residual Oil Gasification and Fuel Gas Cleaning Techniques
   - Detailed content is the same as in point 4.

6. Analysis of Combined Operating Parameters of the Generation and Gasification Units
   - Methods for obtaining partial loads
   - Efficiency as a function of load
7. General Characteristics of Equipment
   - Design characteristics of major non-standard equipment
   - Analysis of equipment weight and dimension
8. Control of Environmental Emission
   - Analysis of formation of harmful components in the process
   - Methods and equipment for preventing environmental pollution
   - Determination and calculation of harmful emissions
9. Technical and Economic Aspects of Selected Configurations
   - Estimated capital expenditures [Comparison to base load station]
   - Electrical Energy Cost
   - Comparison of the technical and economic characteristics in regards to environmental protection
10. Analysis of Commercial Feasibility
   - Classification of equipment
     a. current technology
     b. analogous equipment used in other industries
     c. unique equipment
   - Classification of Processes
     a. current technology
     b. analogous equipment used in other industries
     c. unique equipment

- Problems requiring further studies

  a. requiring design studies

  b. areas of cooperative research and design possibilities

  c. areas of cooperation in equipment fabrications

11. Units for Combined Production of Heat and Energy

- Rationale for configuration selection
- Flow diagrams and description
- Technical and economic characteristics
- State-of-the-art and commercial feasibility

12. Peak Load Power Units

- Peak load and unit requirements [startup time, load following]
- Rationale for configuration selection
- Flow diagrams and description
- Basic characteristics of equipment
- Technical and economic indices
- State-of-the-art and commercial feasibility

13. General Conclusion and Recommendations

APPENDIX IV

A-9 "Complex Methods of Fuel [Coal and Oil] Usage in Energy Generation Systems with Prevention of Harmful Emissions into the Environment"

Status

The US/USSR Project Teams met in the US and discussed the information exchanged. In order to achieve a better comparison of the variations of cost factors, both sides agreed that it was advisable to conduct a detailed cost breakdown for a base load conventional coal/oil fired power plant. This detailed cost analysis will form the basis for evaluation of the economics of the combined cycle to be studied in the future. Additionally both sides agreed to the details of the information to be exchanged in Task III and to the new schedule of the future work.

Scope of Work

Task I

Completed by the Soviet visit to the USA

Task II

Completed by the Soviet visit to the US and the future agreed work is described in Task III

Task III

Based on the results of Task I and Task II, both sides agreed to the information and data that will be exchanged prior to the next meeting of the Soviet and American project teams.

Item 1. The Soviet experts provided to the American experts a full cost breakdown for a coal fired and an oil fired base load conventional power generating plant. This cost analysis includes the total cost for the generation of electrical power. The major factors of the cost analysis are expressed as percentage. These cost data are shown in Attachment IV-1. The American side will analyze these data and the methodology used and forward comments to the Soviet experts. Additionally, the American experts will develop a similar cost analysis for a coal and oil fired conventional base load power plant and forward the data to the Soviet experts. The American cost analysis will use the Soviet methodology. The American side agreed that this review and cost breakdown will be completed and exchanged prior to 1 January 1976. Both sides agreed that the costs will be based on 1975 monetary values. The fuel cost will also represent the 1975 average cost for each country.

Item 2. The technology and cost details of a Soviet combined cycle configuration based on oil gasification and described in Attachment IV-2 will be developed by the Soviet side.

Item 3. The technology and cost details of an advanced American combined cycle based on coal gasification and described in Attachment IV-3 will be developed by the American side.

The exchange of technological information and procedure [Items 1 and 2] will be accomplished in accordance with the agreed procedure identified in Attachment IV-4 and IV-5. The cost analysis of the combined cycles will be developed on the basis described in Item 1. The results of these studies will be exchanged by both sides. These studies will address in detail the technology, economics and operating conditions of the agreed upon combined cycles and in electric power generation. Aditionally, the rationale for equipment selection and selected operating conditions will be present.

Task IV

One month after the exchanged material has been received, both sides will meet in the USSR to review and discuss the exchanged information. The results of the engineering and economic evalution of the combined cycle (Task III) will be used as the basis for defining the future work and schedules for accomplishing the activities. The subject matter that will be addressed is the technology, economics and rationale for the most appropriate present and advanced combined cycle configurations as developed by the cooperative studies of the joint US/USSR project team.

Task V

Both sides will conduct work to optimize the systems selected. The results of the parametric studies will be used to identify the best conceptual designs for an integrated oil and coal gasification, cleanup and combined power plants. The

combined cycle system will include the best technology based on existing equipment and advanced combined cycles based on second generation equipment. The results of these studies will be published in both countries as a joint report. The results of this work and the report will be discussed at the next meeting of the experts in the USA.

Task VI

A visit of the US experts to the USSR will be provided for the joint US/USSR project team ot finalize the joint report for publication. At this meeting, discussion will be conducted on future activities for cooperation.

Schedule

Task I - Completed

Task II - Completed

Task III - 1st Quarter 1976

Task IV - 2nd Quarter 1976

Task V - 4th Quarter 1976

Task VI - 1/2nd Quarter 1977

ATTACHMENT IV-1

Capital and annualized operating costs are to be considered when trying to determine the most economic system designs. These costs are determined by the following formula:

[1] $Z = U + 0.125 \cdot K$ [Rubles ($)/yr]

where Z is the overall annual expenditure

U is the operating cost for the system

K is the fixed capital investment [Rubles ($)]

The cost of the electric energy sent into the transmission line is calculated using the following formula:

[2] $P = \frac{Z}{n \cdot N_e}$

where P is the cost of 1 Kwhr of electricity, averaged annually

n is the operating time in hours of an electric power station at rated power capacity

N_e is the net output of an electric power station

Capital investment cost for industrial construction should include the total cost for environmental control requirements, equipment operation reliability and shakedown costs, but with indirect cost (such as taxes and interest during construction, etc.) excluded.

Equipment, building and construction costs and operating expenditures will be calculated in terms of I.M.U. 1975 cost of currency.

For configuration comparison, a thermal condensation type electric power station is taken as the basis with an output of 2,500 MW with 5 steam turbines of 500 MW each and with post boiler steam parameters of: P = 160 atm, t = 540°C, Resid or coal as fuel.

The following tentative parts cost breakdown in % is used for the overall cost analysis of an electric power station:

		Type of Fuel	
		Resid	Coal
1.	Main Body	50%	51.0%
	including:		
	- construction	9.7	9.6
	- boiler assembly with forced draft and induced draft fans	13.5	14.0
	- steam turbine assembly	9.0	8.7
	- water-feed unit	1.4	1.3
	- piping	5.3	5.2
	- electrical or mechanical equipment	4.1	4.2
	- other equipment	7.0	8.0
2.	Gas Ducting and Stacks	3.8	3.4
3.	Electrotechnical Equipment	4.3	4.1
4.	Fuel Management	2.3	3.5
5.	Technical Water Supply	13.0	11.7
6.	Slag and Ash Removal	--	1.8
7.	Auxiliary Objects	2.3	2.2
8.	Chemical Water Cleaning	1.0	0.8
9.	Transport Management	3.6	3.5

		Type of Fuel	
		Resid	Coal
10.	External Communications	3.0%	2.4%
11.	Site Preparation	1.8	1.6
12.	Temporary Structures	2.5	2.3
13.	Site Landscaping and Other Expenditures	5.5	5.0
14.	Design and Surveying Work, Management Salaries and Personnel Training	1.9	1.7
15.	Contingencies	5.0	5.0
	TOTAL	100%	100%

The overall capital investment for an electric power station consists of the following components:

Construction - 40%

Installation - 15%

Equipment Cost - 45%

The following structure can be tentatively used in determining the capital expenditures solely for the fuel gasification system:

- Cost of equipment - 100%
- Installation of Equipment - 30%
- Piping - 25%
- Control-Measuring Equipment - 8%
- Buildings, Structures, etc.- 35%

Total Shop Cost 193%

General Station Expenditures 30% of Total Shop Cost

TOTAL 250%

The overall expenditures for a fuel gasification system, which are expressed in fractions of the cost of the base electric power station, and which should be added to the cost of an electric power station with combined cycles are also expressed in fractions of the base electric station cost.

The annual operating costs are determined by the formula:

$$[3] \quad U = U_{fuel} + U_{dep} + U_{rep} + U_{pay} + U_{gen} \left[\frac{\text{Rubles (\$)}}{\text{yr}}\right]$$

where U_{fuel} = fuel cost $\left[\frac{\text{Rubles (\$)}}{\text{yr}}\right]$,

U_{dep} = depreciation in $\left[\frac{\text{Rubles (\$)}}{\text{yr}}\right]$,

taken at 7% of K, i.e. $0.07\% \cdot K$

U_{rep} = current repair $\left[\frac{\text{Rubles (\$)}}{\text{yr}}\right]$,

taken at 20% of U_{dep}, i.e., $0.014\% \cdot K$,

U_{rep} includes expenditures for conducting the current repair of the basic investment for all of the shops, salaries of workers and technical engineering personnel involved in current repair, expenditures for acquiring needed materials and spare parts, cost of the services of outside organizations.

U_{pay} = the base and supplementary pay with addition for social insurance on the order of 6.6% to the base and supplementary pay, $\left[\frac{\text{Rubles (\$)}}{\text{yr}}\right]$

U_{pay} takes into consideration the base and supplementary pay of the production personnel of the primary shops, including workers, the technical and engineering personnel and service personnel; the supplementary pay includes bonuses and vacation pay, etc.

U_{gen} = the general station and other expenditures are taken at 1.7% of K, i.e., $0.017 \cdot K$ $[\frac{\text{Rubles (\$)}}{\text{yr}}]$.

U_{gen} includes the expenditures for the managerial and control personnel, safety measures and industrial hygiene, security, expenditures for the maintenance, operation and repair of the buildings and structures included on the plant site (offices, storage facilities, garages, etc.), for reagents, lubricants, all types of oil, funds for the services of outside organizations, etc.

Thus, formula 1 takes the following form:

$$Z = U_{fuel} + U_{pay} + 0.226 \cdot K \ \frac{\text{Rubles (\$)}}{\text{year}}$$

The sides agreed to exchange data on the average cost of fuel (coal, gas and mazut) and salary costs.

After the comparative calculations have been completed, they are to be exchanged for mutual study.

ATTACHMENT IV-2

BRIEF DESCRIPTION OF COMBINED CYCLE CONFIGURATION PRESENTED BY SOVIET SIDE

The principal features of the Soviet configuration consists of the gas turbine which burns a mixture of combustion products of fuel gas and steam.

The atmospheric air is compressed to a pressure of 20-30 atm an air compressor. Part of the air is used for the partial oxidation of residual oil [gasification] and the remaining portion is fed to the combustor to burn the fuel gas.

The amount of compressed air is approximately the stoichiometric quantity needed to burn the fuel gas.

The combustion products of the purified gas are mixed with steam that is exhausted by the steam turbine. The temperature of the steam-fuel gas mixture is controlled to the 1100-1400°C range. These products of combustion are expanded in the gas turbine. The high temperature components of the gas turbine are cooled with steam. The steam is generated by cooling the fuel gas from the residual oil gasifier.

The feed water preheat and primary steam reheat are accomplished by cooling the steam gas mixture in the regeneration following the gas turbine.

The removal of sulfur compounds, ash and carbon from the fuel gas is accomplished by wet methods.

The initial parameters of steam at the steam turbine intake are: temperature of 510 to 540°C and pressure of 130 atm.

ATTACHMENT IV-3

BRIEF DESCRIPTION OF THE COMBINED CYCLE CONFIGURATION PROPOSED BY THE AMERICAN SIDE

The proposed configuration of the power facility is a combination of gas and steam turbine units in which the exhaust gases from the gas turbine are fed into the steam generator.

The atmospheric air is compressed to 20 to 30 atmospheres in the gas turbine driven compressor. Part of the air is supplied to the coal gasification reactor and the remaining portion is used for combustion of the cleaned fuel gas.

Coal is gasified in a fluidized bed unit at a temperature of up to 1100°C; the ash and sulfur compounds are removed from the fuel gas by dry methods in the temperature range of 870 to 1100°C.

The cleaned fuel gas is burned in the combustion section of the gas turbine and the combustion products at a temperature of 1100 to 1400°C are expanded in the gas turbine.

The high temperature components of the gas turbine may be cooled by air, water or steam.

The steam is generated and reheated by cooling the combustion products from the gas turbine and by partial cooling of the gasification products from the coal gasifier.

The initial steam parameters are: temperature, 510°C; pressure, 125 atmospheres.

The estimated distribution of power production: gas turbine 60%, steam turbine 40%. The temperature of the gas turbine combustion products are on the order of 640°C.

ATTACHMENT IV-4

INITIAL DATA FOR CALCULATIONS AND COMPARISONS OF POWER SYSTEMS

1. The basis for comparison will be a base load conventional steam generating plant of 5-500 MW capacity units, with initial steam parameters of 540°C and 160 atms [exit from the boiler].
2. All the power plant configurations will have controls for harmful discharges into the environment and to assure that concentrations of harmful constituents in the emitted flue gases do not exceed 1.2 lbs of sulfur oxide per 10^6 Btu, 0.7 lbs of nitrogen oxide per 10^6 Btu and 0.1 lbs of particulate per 10^6 Btu. Moreover, all the electrical power plant configurations must assure that the concentration of harmful constituents in the atmosphere at ground level below the permissable standard for purity of air established in each country, accounting for the total combined harmful effects of sulfur oxide and nitrogen oxide.
3. For all configurations, the background level of atmospheric pollutants will be assumed as 30% of the maximum permissable standards at the selected site.
4. Fuel compositions that will be used, are as follows:

   A. Coal:

   Ash and Moisture fuel composition

   Wt%

Total C	H_2	O_2	S	N_2	Volatile Matter	Fixed Carbon
82.8	5.5	7.7	2.44	1.7	41.4	58.5

   Moisture 60%

   Ash 10.0%

Calorific Value (Lower heating value) 5444 kcal/Kgrm

Ash and Moisture free calorific value - 14,820 Btu/lb

B. **Residual Oil Composition:**

	Wt%			
C	H_2	S	O_2	N_2
85.0	10.6	3.5	0.45	0.45

Lower Calorific Value 9500 kcal/Kgrm

5. The mode of the power plant operation is base load and operational hours per year will be 6,000. The net annual efficiency of the power plant is assumed to be:

$$Z_{e.n.} = 0.95 \cdot Z_{u.n.}$$

Z_{un} is the net efficiency of the electrical station operating at rated capacity

Z_{en} is the net annual efficiency of the electrical station which takes into account operational factors for start-up and load variations.

6. The capacity of each power unit with the combined cycle configurations will be in the range of 500 MW and will be corrected for the limiting capacity of the air compressor at an air intake of 400 Kgram/sec. When optimizing the selected configuration, the capacity of each unit may be varied.

7. The following level of performance for compressors and turbines are selected for advance power cycle configuration:

- Polytropic efficience of compressor E_c = 90%
- Polytropic efficience of the turbine E_c = 91%

8. The maximum temperature of turbine exhaust is 790°C and the service life of 300,000 hours [the American side is to present calculations justifying the selection of the afore mentioned life in the first quarter of 1976].

9. Power units with different temperatures of turbine intake gas will be compared. The following variations of initial gas temperature will be assumed, 1100°C, 1200°C, 1300°C and 1400°C. The configuration and claculations of the cooling systems for the high temperature components of the gas turbine will be given in the final report.

10. The specification for gas purity into the gas turbine

    a. In the absence of alkali-metal in the products combustion; concentration of sulfur compounds is to be estimated on the requirement for protection of the environment.

    b. In the presence of alkali metal in the products of combustion, their total concentration and the concentration of sulfur [calculated for stoichiometric ratio] should not exceed 3 ppm.

$$[Na] + [K] + [S] \leq 3 \text{ ppm}$$

    c. Techniques for limiting concentration of particulate in the combustion products will be presented by the American side before the first quarter of 1976.

11. A comparison of the selected configuration of power units will be given for various fuel costs which may vary by a fraction of two in respect to the average fuel cost/or 1975.

ATTACHMENT IV-5

STRUCTURE FOR PRESENTATION OF THE SELECTION AND COMPARISON OF THE FUEL GASIFICATION AND GAS CLEANING SYSTEMS

1. Flow diagram with parameters and principles of operation.
2. Characteristics of the generated fuel gas [Composition, ash contents, etc.].
3. Energy and reagent requirements [steam, electrical energy, etc.]
4. Effluent and Emissions subjected to purification.
5. Derived by-products
6. Characteristics of the major non-standard equipment:
   - Major equipment design
   - Parameters which predetermine mode and intensity of operation
   - Size and weight of major equipment and analysis of feasibility to their fabrication and transportation.
   - Specification as to metals and materials for fabrication of major equipment
7. Analysis of the operating conditions of the combined operation of power units and fuel gasification systems
   - Methods for obtaining partial loads
   - Gasification systems efficiency as a function of load
   - Procedures and basic requirements for start-up and shut-down
8. Capital investments for a fuel gasification system and gas cleaning as follows: [in accordance with the recommendations given in Attachment IV-1]:

- Equipment 100%
- Assembly
- Piping
- Control and measuring instruments
- Building, structure, etc

9. Operational costs with detailed breakdown [in accordance with the recommendations given in Attachment IV-1]
   - Additional cost for energy due to the gasification systems such as fuel, steam, energy, etc.
   - Cost of reagnets and by-products
   - Wages
   - Amortization of equipment
   - Repairs
   - General plant expenditure

IRIS

Ray

STATINTL

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

Enclosed (for your information) is a copy of protocol signed (on April 24, 1975) as part of the Particulate Abatement Technology Task Force of Stationary Source Air Pollution Technology Working Groups. The protocol spells out the details of cooperative testing of high efficiency particulate collection equipment which will take place this year in the Soviet Union and United States.

Regards.

STATINTL

[redacted]

It looks like the Soviet visit which is the subject of this protocol will be delayed.

Ray

ENVIRONMENT Air Pollution

CCS
CRS
OSI
OER
BGI([redacted]
4 mil —
Commerce
file - Environment
(air Pollution)

16 Jun 75

STATINTL

P R O T O C O L

of the meeting of the Particulate Abatement Sub-group of the US/USSR Stationary Source Air Pollution Control Technology Working Group

In accordance with the Memorandum of the third meeting of the US - USSR Joint Committee on Cooperation in the Field of Environmental Protection (Moscow, USSR, December 9-12, 1974) and the Protocol of the Meeting of Sub-groups of the US/USSR Stationary Source Air Pollution Control Technology Working Group (Moscow, USSR, October 14 - 25, 1974), a meeting of Soviet and American specialists took place in Moscow, USSR, April 14 - 24, 1975.

American delegation was headed by M-r A.CRAIG, Chief, Particulates and Chemical Processes Branch, Control Systems Laboratory, Environmental Protection Agency; the Soviet delegation was headed by M-r G.LEBEDYUK, Deputy Director of the State Scientific Research Institute on Industrial and Sanitary Cleaning of Gases (NIIOGAZ) of the Ministry of Chemical and Petroleum Machinery. The list of participants is given in Appendix N°1.

The following subjects were discussed at the meeting:

1. Development and agreement on the final program and

Methods of testing of an electrostatic precipitator at the Allan Thermal Power Station in the U.S. and at the Ladyzhino Thermal Power Station in the USSR as well as testing of high-efficiency wet scrubber systems at the Lone Star Steel Company in the U.S. and at the Zaporozhye Ferroalloy Plant in the USSR.

2. Discussion and agreement of organizational and technical details of the visit of Soviet expert groups to the U.S. on the Tasks A-4 and A-6 as well as on the Task A-5.

3. Discussion of possible projects of U.S.-USSR co-operation within the limits of the given sub-group in 1976.

As a result of the Meeting:

On the First Topic

The sides co-operatively developed and agreed on the final program and methods of testing of the E.S.P. at the Allen Thermal Power Station and testing of wet scrubber systems at the Lone Star Steel Company in the U.S. The experts developed a list of instruments and equipment to be shipped by the Soviet side to the U.S., a list of equipment and methods to be furnished by the U.S. side in the U.S.A. as well as procedures adopted by the U.S. side during testing in the U.S. (See Appendix N°2).

Both sides agreed that the above program and methods of research will also be used during testing at Ladyzhino Thermal Power Station and at Zaporozhye Ferroalloy Plant in the USSR but that desired modifications of the program and methods will be done at the conclusion of testing in the U.S.A.

In order to simplify the program of testing the U.S. side will perform calibration of some elements of Soviet measuring instruments. This will be done during the first week of stay of Soviet experts in the U.S.

Such elements include :

1. Pitot tubes.
2. Impactors for measuring dispersion of particles.
3. Null tubes for determination of particle concentration.
4. Instrument for measuring of ash resistivity.

On the second topic

Both sides agreed that the U.S. tests on the Tasks A-4 and A-6 will be carried out in four stages:

1) Calibrating and testing of the instruments and equipment at the National Environmental Research Centre of the E.P.A. (Durham, North Carolina) - 7 days ;

2) Testing of E.S.P. at Allen Thermal Power Station (Charlotte, North Carolina) - 13 days ;

3) Testing of the wet scrubber systems (Longview, Texas) - 11 days ;

4) Summing-up and discussing the results of testing at the National Environmental Research Centre of the E.P.A. (Durham, North Carolina) - 4 days.

The group of Soviet specialists on the Tasks A-4 and A-6 will arrive at New-York on June, 15, 1975 and will leave New-York for the USSR on July, 27, 1975. The route of movements of the Soviet group in the U.S.A. is summarized in Appendix N°3.

Both sides agreed that in accordance with the Program of work on the Task A-5 two Soviet experts should fly to New-York on the 9-th of July, 1975, so that this group could take part in the work on the fourth stage of the group of Soviet specialists on the Tasks A-4 and A-6. Besides, this enables both groups to depart to the USSR at the same time, namely on July, 27, 1975.

The work of the group of Soviet specialists on the Task A-5 will be carried out in two stages:

1) Participation in modification of the U.S. mathematical model of an E.S.P. at Southern Research Institute (Birmingham, Alabama)

Presentation of the results of work of the group on the Tasks A-4 and A-6 at the National Environmental Research Centre of the E.P.A. (Durham, North Carolina).

The route of movements of this group in the U.S. is also given in Appendix N°3.

Both sides agreed that five U.S. experts (instead of four) will participate in testing of dust-collecting equipment in the USSR. One of these specialists will participate in the testing of E.S.P. and the second will participate in the testing of scrubbers.

On the third topic

Both sides compiled a list of problems on particulate abatement from Stationary industrial sources which are of mutual interest and which will be developed beginning with 1976 (See Appendix N°4).

Both sides find it desirable to request participants of the meeting of the Working Group on the technology for preventing air pollution which is to be held in June 1975 to consider possibility of organizing a special meeting of Soviet and American specialists in the third quarter of 1975 for making the final selection of topicts for co-operative development and also for drawing up a detailed plan for carrying out these (development) projects.

In addition the sides agreed on the following during dicussion of the Third Subject :

1. During the testing of particle abatement equipment, the American side will study five types of ash samples submitted by the Soviet side.

2. The Soviet side will give to the American side procedures for selecting the optimal for hammer rapping intervals for the collecting electrodes of E.S.P.'s.

3. The American side will give to the Soviet side the U.S. conference materials on hot-side E.S.P.'s for thermal power stations as well as available information on methods for the dry removal of ash from E.S.P. hoppers (mechanical, pneumatic etc.).

In the course of the meeting both Soviet and the U.S. sides have exchanged materials submitted in accordance with the Protocol of the Meeting of the Soviet-American sub-group on technological methods (Moscow, October, 1974). The list of materials exchanged is given in Appendix N°3.

The two sides recommended that biannual symposia dealing with specific areas of particulate technology control be held. It is recommended that a symposium on electrostatic precipitatio

be held in the USSR during 1976. If the symposium is approved by the Working Group, the two sides will plan the program at the next meeting held.

The U.S. side visited the Lodyzhino Thermal Power Station and inspected the E.S.P. which will be tested by the U.S. experts in the fall of 1975 in accordance with the Tasks A-4 and A-6.

Both sides noted that the meeting of Soviet and the U.S. experts was held in the spirit of friendship, mutual understanding and cooperation.

This Protocol is signed on April 18, 1975 in Moscow in two copies in Russian and English languages, both texts equally authentical.

On the U.S. side

A.CRAIG
Chief, Particulates and
Chemical Processes Branch
Control Systems Laboratory
Environmental Protection
Agency

On the Soviet side

G.LEBEDYUK
Deputy Director on
Scientific Work of the
NIIOGAZ

APPENDIX NO 1

LIST

of the participants of the Meeting of the Particulate Abatement Sub-Group of the US/USSR Stationary Source Air Pollution Control Technology Working Group

USA

A.CRAIG	Chief, Particulates and Chemical Processes Branch, Control Systems Laboratory, Environmental Protection Agency
D.DREHMEL	Specialist, Particulate Technology Section, Control Systems Laboratory, Environmental Protection Agency
B.HARRIS	Specialist, Process Measurements Section, Control Systems Laboratory Environmental Protection Agency
J.PEKAR	Research Associate, Particulates and Chemical Processes Branch, Control Systems Laboratory, Environmental Protection Agency

USSR

G.LEBEDJUK	Deputy Director for Scientific Work of the State Scientific Research Institute (NIIOGAZ), Doctor of Technical Sciences

I.RIZIN	Chief of Electrostatic Methods of Gas Cleaning of the Branch of NIIOGAZ, Master of Technical Sciences
N.BULGAKOVA	Senior Research Worker of Laboratory of Control and Measuring Instruments of NIIOGAZ, Master of Technical Sciences
R.LOZINSKY	Chief of Department of Gas Cleaning of the Organisation on Installation and Operation of Thermal Power Station Equipment
V.TKACHENKO	Chief of Laboratory of Electrostatic Precipitation of NIIOGAZ, Master of Technical Sciences
A.VALDBERG	Chief of Laboratory of Wet Methods of Gas Cleaning of NIIOGAZ, Master of Technical Sciences
I.ERMILOV	Chief of Laboratory of Power Supply Regimes and Reliability of E.S.P.'s, Branch of NIIOGAZ, Master of Technical Sciences
Yu.MILOVIDOV	Chief of Department of NIIOGAZ

B.EFIMOV	Chief of Sector of NIIOGAZ
G.ZALETAYEV	Chief of Information Group, Branch of NIIOGAZ
V.PURTO	Interpreter

Approved For Release 2000/09/06 : CIA-RDP79-00798A000800040001-5

I. LIST OF INSTRUMENTS AND EQUIPMENT TO BE SENT BY THE SOVIET SIDE TO THE UNITED STATES

1. Instruments and equipment to be used in conducting tests on the E.S.P.'s at the Allen Electric Power Station

1.1. Null tubes - 4 units

1.2 Cylindrical stage impactors - 2 units

1.3 Flat stage impactors - 3 sets of replaceable stages for each impactor, with 2 impactors included

1.4 Two-cyclone separator - 2 units

1.5 Device for measuring resistivity - 1 unit

2. Instruments and equipment for scrubbers tests at Lone Star Steel

2.1 Pitot tubes - 2 units. Length 1m and 1.3m

2.2 Standard sampling tubes with internal filtration -2 units

2.3 Portable unit for gas flow rate measurement - 2 units

2.4 Impactors with flat stages (item 1.3, point I) -2 units

2.5 Impactors with cylindrical stages (item 1.2, point I) - 2 units

II. LIST OF EQUIPMENT AND PROCEDURES, PROVIDED BY AMERICAN SIDE FOR TESTS IN THE U.S.

1. For E.S.P. tests at the Allen Plant

1.1 a) Rubber vacuum hoses with internal diameter of 5 mm, length of 30 m

b) Rubber vacuum hoses with internal diameter of 10 mm, length of 20 m.

1.2 Micromanometers - 5 units

1.3 Port adaptors.

a) For adapting null tubes in accordance with provided specimen (32 units)

b) For impactors in accordance with provided specimen (18 units)

c) For resistivity measurement instruments (2 units)

1.4 Vacuum source - 5-6 cfm

1.5 Supports for null tubes

1.6 Pitot tubes L=2.5 m (4 units)

1.7 Electronic balance with an accuracy of 0.1 mg - 0.01 mg

1.8 Multimeter for measuring dust resistivity (method 8)

1.9 Asbestos spacers according to provided specimen (85 units)

2. <u>For scrubber tests at Lone Star</u>

2.1 Micromanometer (4 units)

2.2 Port adapters

a) For standard sampling tubes according to provided specimen (4 units)

b) For impactors according to provided specimen (4 units)

2.3 a) Vacuum rubber hose with inside diameter of 5 mm, length 20 m

b) Rubber vacuum hose with 10 mm inside diameter, length 20 m

2.4 Electronic balance with an accuracy of 0.1 mg - 0.01 mg.

2.5 Impactor heating element

2.6 110/120 v, 20 ampere transformer - (1 unit)

III. PROCEDURES USED BY THE AMERICAN SIDE IN TESTS IN THE U.S.

1. Procedure for measuring humidity.

2. Procedure for measuring weight.

3. Procedure for measuring of resistivity (for E.S.P.'s)

4. Data obtained during measurement of impactor droplet sizing as made by volumetric or/and gravimetric methods used in the U.S.

NOTES

The American side will investigate volt/ampere characteristic measurement by means of manual voltage increase and decrease.

The American side will deliver information on high temperature probe for ash resistivity measurements.

The American side will communicate the conditions required for setting up electronic balances in the USSR.

APPENDIX № 3

THE ROUTE OF MOVEMENTS OF THE SOVIET GROUPS IN THE U.S.A.

The group on the Tasks A-4 and A-6

1. From New York (by air) to Durham (North Carolina) - the first stage.
2. From Durham (by auto) to Charlotte, North Caroline - the second stage.
3. From Charlotte (by auto) to Durham, North Carolina.
4. From Durham, North Carolina (by air) to Dallas, Texas.
5. From Dallas (by auto) to Longview - the third stage.
6. From Longview (by auto) to Dallas, Texas.
7. From Dallas (by air) to Durham, North Carolina (through Atlanta)
8. From Durham, North Carolina (by air) to New York (through Washington, D.C.)

The group on the Task A - 5

1. From New York (by air) to Birmingham, Alabama - the first stage
2. From Birmingham (by air) to Durham, North Carolina (through Atlanta) - the second stage.
3. From Durham, North Carolina (by air) to New York.

APPENDIX N° 4

LIST

OF SUBJECTS ON PARTICULATE ABATEMENT FROM STATIONARY SOURCES WHICH ARE TO BE DEVELOPED BY THE SOVIET AND THE U.S.SIDES BEGINNING WITH 1976

1. Investigations directed towards the maintenance of efficiency and the improvement of the reliability of E.S.P.'s.

2. Utilization of charging of droplets and dust particles in order to improve the efficiency of industrial scrubbers.

3. Investigation of the physical mechanism of re-entrainment in E.S.P.'s and development of methods for decreasing re-entrainment.

4. Cooperative development and testing of methods for measuring sub-micron particles having diameter from 0.01 to 0.2 μ .

INFORMATION AND MATERIALS TRANSMITTED

TO THE SOVIET UNION

Reports Transmitted to the USSR

1. Report N° EPA-650/2-75-016 "Symposium on Electrostatic precipitators for the Control of Fine Particles" (Pensacola, Florida, 9/28/74 to 10/2/74)

2. Report N° EPA-650/2-74-112 "EPA Fine Particle Scrubber Symposium " (San Diego, 5/28-30/74)

3. Report NO EPA-650/2-74-043 "Proceedings: Symposium on the Use of Fabric Filters for the Control of Submicron Particulates" (April 8-10, 1974, Boston, Massachusetts)

4. Report N°EPA-650/2-74-132 "An Electrostatic Precipitator Performance Model" by Grady B.Michols & John P.Gooch dated July, 1972

5. Report NO EPA-650/2-74-074 "Influence of Fly Ash Compositional Factors on Electrical volume Resistivity" by R.E.Bickelhaupt, dated 1974

6. Report N°EPA-650/2-72-092 "Sodium Conditioning to Reduce Fly Ash Resistivity" by R.E.Bickelhaupt dated October, 1974

7. Report N° SORI-EAS-74-233 2"Investigation of Factors Responsible for Corona Electrode Failure" by R.E.Beckelhaupt dated August 26, 1974.

8. Section 8.5 "Precipitators for the Elevated Phosphorous

Industry"(pages 684-721) 1971 ESP Systems Study

Materials Transmitted to the US

Item 1 :

100 ml samples of styrene latices having the following known particle size in microns :

0.500
0.807
1.101
2.202
5.7

Item 2 :

Five stage Brinks Impactor (Serial N° 1035)

Item 3 :

Two boxes Filergias filters

Two boxes membrane filters

INFORMATION AND MATERIALS TRANSMITTED TO THE UNITED STATES

1. Program and procedures for testing the electrostatic precipitators at the ALLEN POWER PLANT in the United States, at the Ladyzhinskaya GRES and the high-efficiency wet scrubbing systems at LONG STATE STEEL in the US and at the Zaporozhye Ferroalloy Works in the USSR.

2. Information.

Engineering and process parameters of the wet scrubbing system for the gases leaving the closed-type ferroalloy furnace producing 45% ferro-silicon at the Zaporozhye Ferroalloy Works.

3. Information.

Engineering and process parameters of the ЭГ-3-3-I77 electrostatic precipitators at the Ladyzhinskaya GRES.

4. Information.

Investigation of the processes of rapping dust from collection electrodes of Soviet-made industrial dry electric filters.

5. Information.

Design and process parameters of horizontal plate-type E.S.P.'s.

6. Information.

Investigation of the physical mechanism of re-entraiment during rapping(film).

7. Film commentary.

8. Information.

Effect of rapping of ESP electrode on removal efficiency.

9. Specimens of port adapters.

10. 14-stage impactor.

11. Two sintered metal filters.